

Schedule

CAST Laboratories Pte Ltd
17 Tuas Ave 8
Singapore 639232

Certificate No. : LA-1988-0023-B

Issue No. : 24

Date : 30 May 2018

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FIELD OF TESTING : Civil Engineering Testing

ITEMS/MATERIALS/ PRODUCTS TESTED	TESTS/PROPERTIES	STANDARD METHODS/ TECHNIQUES EQUIPMENT	APPROVED SIGNATORY
A. Aggregates	1. LA Abrasion value (Resistance to Fragmentation)	ASTM C131-14 SS 73 : 1974 BS EN 1097-2:2010	) TMC/KYS/LEH/DS/) TEK/YCH))
	2. Angularity Number	SS 73 : 1974 BS812 : Pt 1 :1975)))
	3. Bulk Density & Voids	BS 812-2 : 1995 SS 73 : 1974 BS EN 1097 -3:1998))))
	4. Crushing Value	BS 812:Pt 110:1990 SS 73 : 1974)))
	5. Elongation Index	BS 812 : Pt 105.2 : 1990 SS 73 : 1974)))
	6. Flakiness Index	BS 812 : Pt 105.1 : 1989 SS 73 : Pt 5.1 : 1992 BS EN 933 -3 : 2012))))
	7. Impact Value	BS 812 : Pt 112 : 1990 SS 73 : 1974)))
	8. Organic Impurities	ASTM C40-11 SS 73 : Part 22 : 1992))

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	9. Silt Content	SS 73: 1974 (1992)) TMC/KYS/LEH/DS/) TEK/YCH
	10. Particle Size Distribution	BS 812 : Pt 103.1 : 1985 SS 73:1974 BS EN 933-1 : 2012.))))
	11. Relative Density /Water Absorption	BS 812-2 : 1995 SS 73 : 1974 BSEN 1097-6 : 2013))))
	12. Fine Content	BS EN 933 -1 : 2012))
	13. Water Content (Moisture Content Oven Dry Method)	BS 812-109 : 1990 BS EN 1097-5 : 2008)))
	14. 10% Fine Value	BS 812 : Pt 111 : 1990 SS 73 : 1974)))
	15. Shell content	BS 812-106:1985 BS EN 933-7 : 1998 SS 73: Pt 6: 1992)))
	16. Potential Alkali Reactivity for Aggregates (Mortar Bar Method)	ASTM C1260-07, 14	) CTJ/YCH/FSM))
	17. Particle Density of filler	BS EN 1097- 7 : 2008	) TMC/CTJ/KYS/DS/EK)
	18. Methylene Blue	BS EN 933-9 : 2009+A1:2013))
	19. shape index	BS EN 933 – 4 : 2008	TMC/CTJ/KYS/DS/EK

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	20. Test for Thermal and Weathering Properties of Aggregates Part 4: Determination of Drying Shrinkage	BS EN 1367-4 : 2008) CTJ/FSM/YCH))))
	21. Determination of the Resistance to Wear (Micro-Deval)	BS EN 1097-1 : 2011	) CTJ/TEK/DS))
	22. Sampling	BS EN 932-1 : 97	) TMC/CTJ/KYS/LEH) DS/YCH
	23. Materials Finer than 75 um	ASTM C117-2013, 17)
	24. Sand Equivalent Test	BS EN 933-8: 2012+A1: 2015	) CTJ/YCH/DS))
	25. Percentage of Fractured Particles	ASTM D5821-13 (2017))))
	26. Water Absorption (coarse)	ASTM C127-15))
	27. Water Absorption (fine)	ASTM C128-15)
	28. Sieve Analysis	ASTM C136-14	CTJ/YCH/DS
	B. Bricks	1. Compressive Strength	SS 103 : 1974 (Confirmed 1989) BS EN 772 - 1 : 2011 +A1: 2015 BS 3921 : 1985	) TMC/CTJ/HM/DS ) ) ) )
2. Dimensions		BS 3921 : 1985 SS 103 : 1974 (Confirmed 1989) BS EN 772 - 16 : 2011) TMC/CTJ/HM/DS)))

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C. Concrete 1. Hardened Concrete	3. Water Absorption	BS EN772 – 7 :1998 SS 103 : 1974 (except Method V, Confirmed 1989)) TMC/CTJ/HM/DS))))
	4. Determination of total / Salts content	SS 103 : 1974 (Confirmed 1989))))
	5. Efflorescence Test	SS 103 : 1974 (Confirmed 1989)))
	1. Compression Test on Cubes	SS 78 : Pt A16 : 1987 BS EN 12390 : Pt 3 : 2009	) TMC/CTJ/KYS/DS/) HM))
	2. Compression Test on Cylinders	ASTM C39 / C39M-17b BS EN 12390 : Pt 3: 2009))))
	3. Compression Test on Concrete Cores	SS 78 : Pt A20 : 1987 (BS EN 12504: Pt 1: 2009) BS EN 12390 : Pt 3 : 2009 ASTM C39 / C39M-14)))))
	4. Density Test on Hardened concrete/ cores (a) as-received density (b) oven-dried density (c) saturated density	BS EN 12390 : Pt 7 : 2009 SS 78:pt A 14:1987) TMC/CTJ/KYS/DS/) HM)))

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	5. Flexural Strength	BS EN 12390 : Part 5 : 2009 SS 78:Pt A 18 : 1987 ASTM C78-10e1 BS 1881:Part 118 :1983) TMC/CTJ/KYS/DS/) HM))))	
	6. Water Absorption	BS 1881 : Pt 122 : 2011 SS 78 : Pt A22 : 1987)))	
	7. Indirect Tensile Strength (Splitting Tensile Strength)	SS 78 : Part A17 : 1987 BS EN 12390 : Part 6 : 2009 ASTM C496-2011))))	
	8. Static Modulus of Concrete	BS 1881 : Part 121 : 1983))	
	9. Rapid Chloride Penetration Test	ASTM C1202-12, 17)))	
	10. Absorption & Permeability Voids Test	ASTM C642-13)))	
	11. Water Penetration Test	DIN 1048 Part 5 : 1991 BS EN 12390-8 : 2009))	
	12. Initial Surface Absorption Test	BS 1881 : Pt208 : 1996	) TMC/KYS/DS/)
	2. Hardened Concrete NDT	1. Covermeter Test	BS 1881 Pt 204 : 1988 SS78 : Pt B4:1992, 2013) CTJ/LEH/MURU/DS))
		2. Ultrasonic Pulse Velocity Test	BS EN 12504-4 : 2004 SS 78 : Pt B3 : 1992 ASTM C597-16)))
		3. Rebound Hammer Test	SS 78: Pt B2 :1992 BS EN 12504-2 : 2012) CTJ/LEH/MURU/DS))
		4. Penetration Resistance Test	ASTM C803/803M-03 (Reapproved 2010),17))

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	5. Half-cell potential Measurement	ASTM C876-15) LEH/MURU/DS))
	6. Measurement of Carbonation (Cores / Broken Concrete)	BRE IP 6/81 BS EN 14630: 2006)))
	7. In-situ Pull out test on tiles, Plaster, prepacked plaster Skimcoat and screed	CAST/SITE/HCN/001/12 ASTM D4541-09e1 BSEN 1015-12:16	) CTJ/TMC/KYS/MURU) /DS/LEH)
3. Concrete Fresh Concrete	1. Dimensional Measurement On Cube Mould	SS78 : Pt A8: 1987 BS EN 12390-1 : 2012	) TMC/KYS/LEH/DS)
4. Precast Concrete Units			
i. Concrete Blocks	1. Compressive Strength	SS 271 : 1983	) TMC/KYS/LEH/DS) CTJ/HM
	2. Density Test))
	3. Dimension Measurement))
ii. Concrete Masonry	1. Compressive Strength	SS 271 : 1983 BS EN 772 – 1 :2011 +A1: 2015))))
	2. Water Absorption	BS EN 772 – 11 :2011 SS 271 : 1983)))
	3. Dimension Test	BS EN 771 – 3 :2011 +A1: 2015 BS EN 772 – 16 :2011))))
iii. Concrete Paving Blocks	1. Compressive Strength	BS 6717-1 : 1993))

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iv. Concrete Kerbs	2. Dimension Test	BS 6717-1 : 1993 BS EN 1338 :2003) TMC/KYS/LEH/DS) CTJ/HM
	3. Total Water Absorption	BS EN 1338 : 2003 (Annex E)	) TMC/KYS/DS) CTJ/HM
	4. Surface Layer Thickness	CAST/ BTD/ CPB/001/12))
	1. Compressive Strength	SS 214 : 2009, BS EN 12390:Pt 3 :2009))
v. Concrete Kerbs / Dividers/Channels Kerb	1. Transverse Strength	SS 214 : 1999))
	2. Bending Strength Breaking Load	SS 214 : 2009 BS EN 1340 : 2003 Annex F)))
	3. Water Absorption	SS 214 : 1999 BS 7263 – 1 : 1994))
vi. Concrete Flags/ Slabs	1. Transverse Strength	BS 7263-1 : 2001 ,))
	2. Water Absorption	BS EN 1339 : 2003 Annex E))
	3. Layer Thickness	CAST/BTD/CFS/002/12))
vii. Precast Concrete Units/ Concrete Kerbs/ Dividers/ Channels	1. Total Water Absorption	SS 214 : 2009 BS EN 1340 : 2003 ANNEX E)))
viii Ferro-cement Slab	1. Dimensional measurement	CAST/ MAT /TM/ 010-99	) TMC/KYS/DS) CTJ/HM
	2. Initial surface absorption test	BS 1881 : Pt 208 :1996))
	3. Carbonation test	BRE IP 6/82 BS EN 14630:2006))

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D. Hot Dip Galvanised Steel	1. Thickness of Coating	BS EN ISO 1461:2009	TMC/MURU/DS
E. Bituminous Mixtures	1. Bitumen Content	ASTM D2172 / D2172M-11	) TMC/CTJ/KYS/) LGH/DS/NCY
	2. Density of Premix on Cored Samples with & without sample preparation	BS 598 : Pt 104 : 2005)))
	3. Bulk Specific Gravity and Density	ASTM D2726 / D2726M-14)))
	4. Marshall Density & Stability	BS 598 : Pt 107 : 2004 ASTM D1559-89)))
	5. Marshall Stability and Flow of Asphalt Mixture	ASTM D6927-15)))
	6. Particle Size Distribution	BS 812 : Pt 103.1 : 1985 BS EN 933 - 1 : 2012)))
	7. Percentage Voids Density of Core Method	BS 598 : Pt 104 : 2005 Annex E)))
	8. Thickness of Core	ASTM D3549-11)))
	9. Bitumen Content by Ignition Method	ASTM D6307-16 (Method B))))
	10. Determination of Wheel- Tracking Rate (Dry)	BS 598 : Pt 110 : 1998)))
	11. Los Angeles Abrasion	CAST/PAV/LAA 001/ 12	) TMC/CTJ/KYS/) LGH/DS/NCY
	12. Measuring Pavement Macrottexture Depth (Volumetric Technique)	ASTM E965-15) TMC/CTJ/KYS/) LGH/DS/MURU)

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i. Pavement and Asphalt Materials	13. Measuring Pavement Macrottexture Depth (Volumetric Technique)	ASTM E965-15) TMC/CTJ/KYS/) LGH/DS/MURU))	
	14. Measuring Surface Frictional & Properties (British Pendulum Tests)	ASTM E303-93 (2013))))	
	15. Measuring Longitudinal Profile and Computing - International Roughness Index (IRI)	CAST/SITE/IRI/001/2017	)MURU/NN/LGH/CTJ)KYS/DS))	
	ii. Asphalt Concrete Paving Mixture	16. Effect of Moisture on Asphalt Concrete Paving Mixture - Tensile Strength Ratio (TSR)	ASTM D4867/D4867M-09 (2014)	)LGH/NCY/CTJ/KYS/)DS))
		17. Sieve Analysis of Extracted Aggregate	ASTM D5444-15	) CTJ/KYS/DS/)LGH/NCY))
		18. Theoretical Maximum Specific Gravity & Density	ASTM D2041-11)))
		19. Percent Air Voids	ASTM D3203-17)))
		20. Preparation of Bituminous Specimens using Marshall Apparatus	ASTM D6926-16))))
		21. Draindown Characteristics in Uncompacted Asphalt Mixtures	ASTM D6390-11)))
		F. Soil	1. Bulk Density	BS 1377 : Pt 2 : 1990 (Clause 7.2)	) DS/TEK/AKL )
2. California Bearing Ratio	BS 1377 : Pt 4 : 1990 (Clause 7) ASTM D1883 -16) DS/TEK/YM) DS/TEK/MT	

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	3. Consolidation Test (1-Dimensional)	BS 1377 : Pt 5 : 1990 (Clause 3)) DS/TEKAKL)
	4. Direct Shear Test	BS 1377 : Pt 7 : 1990 (Clause 4)) DS/TEK/AKL)
	5. Dry Density / Moisture Content Relation	BS 1377 : Pt 4 : 1990 (Clause 3)	) TEK/DS/YM)
	6. In-situ Dry Density (Sand Replacement)	BS 1377 : Pt 9 : 1990 (Clause 2)	) CTJ/TEK/DS)
	7. Liquid Limit (Cone Penetrometer)	BS 1377 : Pt 2 : 1990 (Clause 4.3) ASTM D4318 -17	) TEK/DS/AKL) TEK/DS/AKL/KYS
	8. Plastic Limit	BS 1377 : Pt 2 : 1990 (Clause 5.3) ASTM D4318-17	) TEK/DS/AKL) TEK/DS/AKL/KYS
	9. Plasticity index	BS 1377:Pt 2: 1990 ASTM D4318-17	KYS/TEK/DS TEK/DS/AKL/KYS
	10. Moisture Content (Lab)	BS 1377 : Pt 2 : 1990 (Clause 3.2)	) TEK/DS/AKL))
	11. Particle Density	BS 1377 : Pt 2 : 1990 (Clause 8.3))))
	12. Particle Size Distribution (Hydrometer)	BS 1377 : Pt 2 : 1990 (Clause 9.5)	) TEK/DS/AKL))
	13. Particle Size Distribution (Wet Sieving)	BS 1377 : Pt 2 : 1990 (Clause 9.2))))
	14. Triaxial Test (CD)	BS 1377 : Pt 8 : 1990 (Clause 8))))
	15. Triaxial Test (CU)	BS 1377 : Pt 8 : 1990 (Clause 7))))
	16. Triaxial Test (UU)	BS 1377 : Pt 7 : 1990 (Clause 8))))

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	17. Unconfined Compression Test	BS 1377 : Pt 7 : 1990 (Clause 7.2 & 7.3) ASTM D2166:16)))
	18. Density & Moisture Content -Nuclear Density Gauge	ASTM D6938-10, 17 BS1377 : PT9 :1990	) CTJ/ TEK/DS)
	19. Minimum Density of Sand Method (Method A & C)	ASTM D4254-06e1, 14 (Re-approved 2006e)	) TEK/DS/YM)
	20. Insitu Density by Core Cutter Method	BS 1377 : Pt 9 : 1990	) TEK/DS/YM)
	21. Plate Bearing Test	BS 1377 : Part 9 : 1990	CTJ/TEK/DS
	22. Determination of Thermal Conductivity of Soil & Soft Rock by Thermal Needle Probe procedure	ASTM D5334-08, 14	) TEK/DS/YM)))
	23. Moisture Content by Speedy tester	ASTM D4944-2011	) KYS)
	24. Linear shrinkage	BS 1377:Pt 2: 1990	)KYS/TEK/DS)
	25. Max & Min dry density	BS 1377:Pt 4:1990))
	26. Density index (cl 4)	BS 1377:Pt 4:1990))
	27. Insitu California Bearing Ratio (CBR) Site Test	BS 1377: Pt 9: 1990 (Clause 4.3)	)TEK/CTJ/DS))
	28. Lab Compaction of Soil - Standard Effort	ASTM D698-12e2	)TEK/DS/TMC))
	29. Lab Compaction of Soil - Modified Effort	ASTM D1557-12e1))
	30. Density of Bituminous Concrete using NDG	ASTM D2950 / D2950M-14)TMC/CTJ/KYS/DS/)TEK

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G. Rock cores	1. Point Load Strength Index	ASTM D5731-08, 16) CTJ/TEK/ YM)
	2. Unconfined Compression Test	ASTM D7012-10,13, 14, 14e1 (Method C only)))
H. Tiles	1. Water Absorption (Boiling Method)	BS EN ISO 10545:3:1997	) CTJ/ TMC/ DS))
	2. Friction Coefficient, Dry Floor Friction Test (Slip resistance test)	SS485 : 2011 (Annex B))))
	3. Wet Pendulum Test	SS 485 : 2011 (Annex A)	)TMC/DS/CTJ/MURU)
	4. Resistance to Deep Abrasion for Unglazed Tiles	BS EN ISO 10545-6: 2010, 2012	) TMC/DS/CTJ))
	5. Determination of dimensions & surface quality	BS EN ISO 10545-2:1997 ISO 13006:2012 BS EN 14411: 2006, 2012	) TMC/DS/CTJ))
	6. Determination of Modulus of rupture & breaking strength	BS EN ISO 10545-4 : 2004, 2014 BS EN 14411:2006, 2012	) TMC/DS/CTJ))
	7. Scratch Hardness	SS 301:1985 SS 57 : 1989 BS 6431: PT13:1986 EN101: 1991	) TMC/DS/CTJ)))
	9. Colourfastness of title	SS301 : 1985 SS57 : 1989	) TMC/DS/CTJ)
	I. Clay Roofing Tile and Fitting	1. Transverse strength	SS 70 : 2001	) TMC/DS
2. Water absorption		SS 70 : 2001)
3. Permeability		SS 70 : 2001)
4. Colour fastness (Glazed Tiles only)		SS 70 : 2001))

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J. Dimension Stones	1. Water Absorption & Bulk Specific Gravity	ASTM C97 / C97M-09) CTJ)
K. Bituminous Emulsion Membrane	1. Bituminous Membrane Thickness (Adopted from HDB Requirements)	CAST/BTD/BEM/001/12	) TMC/CTJ/FSM/KYS) YCH))
	2. Unit Weight (Adopted from HDB Requirements)	CAST/BTD/BEM/002/12))
L. Admixtures	1. Water Reduction / Increase in Consistence Slump Test Flow Test	BS EN 480-1 : 2006+A1:2011, 2014 BS EN 12350-2 : 2009 BS EN 12350-5 : 2009	) TMC/CTJ/DS)))
	2. Air Content	BS EN 12350-7 : 2009 BS EN 480-1 : 2006+A1:2011, 2014	) TMC/CTJ/DS))
	3. Bleeding	BS EN 480-4 : 2005 BS EN 480-1 : 2006+A1:2011, 2014)))
	4. Density of fresh concrete	BS EN 12350-6 : 2009 BS EN 480-1 : 2006+A1:2011, 2014)))
	5. Setting	BS EN 480-2 : 2006 BS EN 480-1 : 2006+A1:2011, 2014)))
	6. Capillary Absorption	BS EN 480-5 : 2005 BS EN 480-1 : 2006+A1:2011, 2014)))

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M. Cement i. Cem I/ Cem II Cem III / Cem IV Cem V types as per SS EN 197-1 : 2008	7. Compressive Strength	BS EN 12390-3 : 2009 BS EN 480-1 : 2006+A1:2011, 2014) TMC/CTJ/DS))	
	1. Fineness (Blaine Air Method)	BS EN 196 : Pt 6 : 2010 SS 397 : Pt 6 : 1997 SS26 : 1984 (1997)	) TMC/CTJ/DS/) KYS/CPY))	
		2. Standard Consistency Setting Time Soundness	BS EN 196-3 : 2005 + A1 : 2008, 2016 SS 397 : Pt 3 : 1997 SS 26 : 1984 (1987)))))))
	3. Compressive Strength	BS EN 196 : Pt 1: 16 SS 397 : Pt 1 : 1997 SS 26 : 1987 (1997))))	
		1. Moisture Content	BS EN 15167 : Pt 1 : Annex A : 2006 SS EN 15167 : Pt 1 : Annex A : 2008	) TMC/CTJ/DS/) KYS/CPY))
	N. Building Materials i. Prepacked Plaster	1. Tension Adhesion Strength	BS EN 1015 - 12: 16	)TMC/CTJ/FSM/CPY))
		2. Linear Shrinkage	ASTM C531-00 (2012)))
			1. Tension Adhesion Strength	BS EN 1015-12 : 16
		2. Linear Shrinkage		ASTM C531-00 (2012)
		iii Floor Screed and Water Proof Screed	1. Compressive Strength	ASTM C109M-16a
2. Flowability (hydraulic cement mortar)			ASTM C1437-15)))
3. Slip/skid Resistance of Surface – Pendulum Test			BS EN 13036-4:11)))

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iv Tile Adhesive	1. Determination of Tensile Adhesion Strength	BS EN 12004-2 : 2017) TMC/CTJ/FSM/CPY))
	2. Determination of Open Time	BS EN 12004-2 : 2017)))
	3. Transverse Deformation Test	BS EN 12004-2 : 2017))
v. Tile Grout	1. Determination of Resistance to Abrasion	BS EN 12808 – 2 : 2008	) TMC/CTJ/FSM/CPY))
	2. Determination of Flexural Strength & Compressive Strength	BS EN 12808 – 3 : 2008)))
	3. Determination of Shrinkage	BS EN 12808 – 4 : 2009))
	4. Determination of Water Absorption	BS EN 12808 – 5 : 2008))
O. Structural Fixings	1. In-situ pull out test on Structural fixings	CAST/ NDT CONC/ TM/ 002/ Nov 004	) CTJ/DS/ MURU))
P. Paint / Coating	1. Non-Destructive Measurement of Dry Film Thickness of Non-Magnetic Coatings Applied to a Ferrous Base	ASTM D7091-12)))))
Q. Repair Materials Compressive Strength	1. Compressive strength of hydraulic cement mortar (50 mm cubes)	ASTM C109/109M-16a	) TMC/KYS/DS) CTJ/FSM)
R. Curtain Walls & Window joints	2. Water Penetration test (field water tightness test)	CAST/SITE/WTT/001/12 (CONQUAS 21) AAMA 501.2: 09	) CTJ/DS/KYS))
S. External Concrete Wall / Gable End Wall Joints	3. Water Penetration test (field water tightness test)	CAST/SITE/WTT/002/14 (Jan 2016)) CTJ/DS/KYS) MURU/NN

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T. Cement Treated Base	1. Moisture Density Relationship	ASTM D558-11(Method A)) TEK/DS/TMC))
	2. Optimum Moisture Content	ASTM D558-11(Method A)))
	3. Maximum Dry Density	ASTM D558-11(Method A))
	4. Liquid Limit, Plastic Limit and Plasticity Index	ASTM D4318-17)TEK/AKL/DS)

Approved signatories

Mr Tian Mong Ching	-	TMC	Mr Lim Eng Heng	-	LEH
Mr Chai They Jhan	-	CTJ	Mr Foo Siang Meng	-	FSM
Mr Kwek Yeow Seah	-	KYS	Mr Hamidon Bin Mostaffar	-	HM
Mr D Subramanian	-	DS	Mr Ng Chee Yong	-	NCY
Mr Tay Ee Kwang	-	TEK	Mr Aung Ko Lat	-	AKL
Mr Yeo Chor Hwee	-	YCH	Ms Yamin	-	YM
Mr T Murugesan	-	MURU	Mr Naina	-	NN
Ms Lim Geok Hua	-	LGH	Ms Chin Pui Yee	-	CPY
Mr Moorthy	-	MT			

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid test results. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.